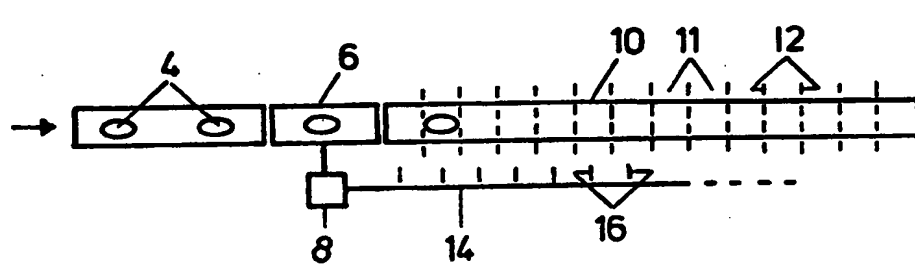


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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁶ : B65B 25/06, 35/10	A1	(11) International Publication Number: WO 95/35238 (43) International Publication Date: 28 December 1995 (28.12.95)
(21) International Application Number: PCT/DK95/00253 (22) International Filing Date: 19 June 1995 (19.06.95) (30) Priority Data: 0716/94 17 June 1994 (17.06.94) DK (71) Applicant (for all designated States except US): SCANVÆGT A/S [DK/DK]; P.O. Pedersens Vej 18, DK-8200 Århus N (DK). (72) Inventors; and (75) Inventors/Applicants (for US only): GRUNDTVIG, Lars [DK/DK]; Lykkensdalsvej 10, DK-8220 Brabrand (DK). SKOVSGÅRD, Jesper [DK/DK]; Ydingvej 95, DK-8660 Skanderborg (DK). (74) Agent: SKØTT-JENSEN, K.; Patentingeniører A/S, Lemmingvej 225, DK-8361 Hasselager (DK).		(81) Designated States: AM, AT, AT (Utility model), AU, BB, BG, BR, BY, CA, CH, CN, CZ, CZ (Utility model), DE, DE (Utility model), DK, DK (Utility model), EE, ES, FI, FI (Utility model), GB, GE, HU, IS, JP, KE, KG, KP, KR, KZ, LK, LR, LT, LU, LV, MD, MG, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SK (Utility model), TJ, TM, TT, UA, US, UZ, VN, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG), ARIPO patent (KE, MW, SD, SZ, UG). Published <i>With international search report.</i>
(54) Title: A METHOD AND A SYSTEM FOR FORMING WEIGHED PORTIONS OF FOODSTUFF ARTICLES ARRANGED IN AN ORDERLY PATTERN  (57) Abstract <p>In the laying out of high quality foodstuff slices (4) on carrier plates (48) for use in packings, e.g. slices of salmon arranged in imbricated formation, it is customary that the work is done manually, when there is aimed at packings of a predetermined weight. According to the invention it is possible to effect the work automatically, in using a weight controlled merging of slices (4) by means of a sorting system having a grader conveyor (10, 66), from which the slices, in a positively guided manner, are transferred selectively to respective receiver stations, controlled by a dynamic weighing system (6, 8) at the entrance to the sorting conveyor. Each receiver station is provided with means for arranging the successive slices, which will typically arrive rather irregularly, in the desired neat manner on the relevant support plates as supplied from associated magazines.</p>		

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A METHOD AND A SYSTEM FOR FORMING WEIGHED PORTIONS OF FOODSTUFF ARTICLES ARRANGED IN AN ORDERLY PATTERN

The present invention relates to a method and a system for forming weighed portions of foodstuff articles arranged in an orderly pattern, e.g. slices of salmon or ham placed in imbricated formation on a carrier plate. This kind of grouping or laying out is normally effected purely manually, when the packings are wanted to exhibit a predetermined weight, inasfar as towards the end of the laying out of a portion it may be required to select articles with a noticeable overweight or subweight in order to reach the desired total weight. It is known that relevant slice cutting machines may be provided with an equipment for automatically laying out the successively cut slices on carrier plates, which are currently displaced for achieving the desired result, but normally this method will be limited to the laying out of a specific number of consecutive slices, whereby the weight of the packings may vary considerably, all according to the size of the slices, which size will normally vary throughout the cuttings of the consecutive foodstuff units.

It is the purpose of the invention to provide a method enabling an improved, automatically controlled grouping of articles such as the said slices in a weight controlled manner, preferably into ordered groups of a predetermined weight.

The invention, when analyzed, can be considered built on the consideration that it is possible to solve one part of the problem or purpose by means of a known distribution technique, viz. a selective supply of single and singularly weighed articles for a current building up, in different receiver stations, of a plurality of article portions with a known or predetermined total weight, while the remaining part of the problem or purpose can be solved, in principle, by using the type of grouping means already mentioned to be known from certain cutting machines, only now being used in the

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plural in one processing unit, viz. one at each receiver station. It is an essential contribution that the receiver stations are thus used not only for receiving the articles, but also for further individual handling or processing in the separate receiver stations.

The said technique for the building up of article portions is exercised in so-called 'graders' or batching systems comprising a feeding belt which receives the articles one by one and conveys them over a dynamic weigher, such that each article is weighed while moving and the weighing results are registered in a computer. Thereafter the articles are brought further along a sorting stretch having at one or both sides a row of receiver containers, while above the stretch selectively actuatable ejector or diverter means are provided, which may be controlled by the computer for delivery of specific articles to specific receiver containers. Thus, the computer will know currently how many articles are present in the single containers, as well as the weight of the collected portions therein, and with the use of suitable control programmes the computer will then be able to join together articles of more or less different weight into single containers such that they summarize into portions of the desired final weight. The portions are let out as soon as they are finished, and the emptied containers may be used again immediately thereafter.

Thus, the flow of articles will be distributed to a number of receiver stations on a weight controlled basis, and the salmon slices mentioned as an example will be good candidates to be portioned out in accordance with this basic principle, already if they could be delivered in unordered heaps, even though they are not particularly easy to handle for a safe and orderly delivery.

However, as already mentioned, it is a possibility

according to the invention to arrange for such a delivery and pick-up function that the articles at the single receiver stations may be guided in a well controlled manner for the formation of the desired grouping on a relevant carrier plate, e.g. cardboard pieces as far as the salmon slices are concerned. A portioning with imbricated formation may be effected, as by the known cutting machines, by a successive slice delivery to an e.g. stepwise moved carrier plate, with the difference, however, that this motion should not take place with some constant frequency, but in direct dependence of each new article arrival, these arrivals being likely to occur rather irregularly and not regularly as from the cutting machine.

The carrier plates or supports, on which the slices are caused to be deposited, should not necessarily be the final carrier plates as present in the final packings, as the laying out could be done on fixed plate means with a following collective transfer of the slices to the final carrier. On the other hand, it is highly advantageous to arrange the slices directly on the final carrier plates, which may be fed automatically from respective magazines.

Once machinery is used for distributing the weighed slices and for displacing the receiver plates there will be many possibilities of arranging the slices in different patterns, even in a circular row. Thus, by way of example, the system may be programmed to lay out first some transverse rows of small pieces and then some large pieces in one longitudinal row, or one row of large pieces in one direction and another, parallel row of small pieces in the opposite direction, or even large pieces in a star pattern. Normally, however, the straight one row pattern will be preferred.

In the following the invention is described in more detail with reference to the drawing, in which:-

Fig. 1 is a schematic top view of a system according to the invention, while

Figs. 2-7 are illustrations of different examples of applicable transfer systems.

Fig. 1 shows a feeding belt 2, which, in any suitable manner, is supplied with mutually spaced, single articles 4 desired to be controlled in portions of one or more specified weights. The articles thereafter pass over a dynamic weigher 6, where their weight and relative position are registered in a computer 8. The articles are then transferred to a longer belt 10, along which there is mounted a row of receiver stations 11, illustrated by partition lines 12 only. It is also shown that the computer 8 has an exit control wire 14 with branches 16 to the single receiver stations, this referring to the computer being able to actuate a transfer device at each of the stations 11 for transferring a selected article 4 to just that station. The computer holds information of the partial weights hereby delivered to the respective stations and the total article weight present in each station. As soon as the total weight in a given station corresponds to the desired portion weight, the computer arranges for an emptying of that portion, to an underlying conveyor belt for bringing the portion to a non-illustrated final packing station.

Articles of a weight making them unsuitable to participate in the portion formation, e.g. if they are too light to placeable as the last article in one of the otherwise filled receiver containers, may be let out to the last container or just be moved out over the end of the belt 10, subject to being recirculated.

Now, according to the invention these receiver containers should be replaced by local portioning and grouping stations satisfying more basic conditions.

1) They shall comprise means for achieving a safe,

selectively controlled and well ordered transfer of articles from the belt 10;

2) They shall comprise means for securing that the transferred articles are delivered in an orderly manner for infeed into the very grouping station; and

3) They shall comprise a grouping system operable to effectively handling articles delivered thereto with highly varying intervals of time.

The invention has been developed almost in spite of a basic knowledge of the fact that the diverter or ejector means conventionally used is portioning machines of the type shown in Fig. 1 are highly unsuitable for the present purpose, at least as far as salmon slices are concerned, but also in respect of other thin and sticky articles. With the use of inclined scrapers the articles will curl together and even remain sticking to the scraper, and a real ejector action on the articles will make these very much deformed and impossible to catch in a reasonably orderly manner. Therefore, the very removal of the articles from the belt according to the above item 1) is one basic problem to be solved, and as will be clear from the following this may even lead to solutions, in which the removing means are integrated in the conveyor 10 itself. In these cases, the removing means will not be specific for the single receiving stations, but rather specific for the conveyor.

If the belt 10 is desired to be kept as a usual conveyor belt it is decisive that the single grouping stations be provided with special means for removing the articles from the belt. As shown in Fig. 2 such means may comprise overhead rollers 20 mounted in a hight displaceable manner in guides 22 and provided with radially displaceable gripping needles 24, which, in the lowered position of the associated roller, protrude downwardly to the top side of the belt 10, while the same needles during the further rotation of the roller

in clockwise direction are successively retracted into full retraction at the top side of the roller. Consequently, an article 4 conveyed on the belt 10 will be hit by the lower needles 24 as moved rearwardly of the conveying direction, whereby the front edge of the article is compulsory lifted and gripped by or on the needles, which will thereafter "roll" the article up to the top side of the roller, where now the needles are retracted to or beyond the surface of the roller. Hereby a short scraper blade 26 will be able to scrape off the flat article from the roller and guide it to a longitudinally or transversely directed conveyor belt 28, whereby the problem of the above item 1) will be solved. A longitudinal orientation of the conveyor 28 is shown in dotted lines at 30, conveying obliquely upwardly, whereby the picked up articles 4 can be delivered to upper, receiving grouping stations, without these taking up space between the rollers 20. Control means are provided for lowering the relevant rollers at the relevant moments of time for the selective article picking up.

In connection with the invention it will be an at least theoretical possibility that there is arranged, on the belt 10, an orderly picking up of the articles 4 by means of razor blade sharp scraper plates, but at least for the present this is considered to be unrealistic.

Fig. 3 illustrates another system for an orderly take up of articles 4 from a conventional belt 10. The system comprises an overlying belt 32, which, along a lower stretch 34, runs parallel with and in synchronism with the belt 10. The belt 32 may consist of parallel narrow belts, and overhead the stretch 34 is mounted a pressure plate 36 on a piston rod connected to a fixed cylinder 38. The belt 32 is provided with suitably interspaced, projecting, hook-like needles 40, which, by means of the pressure plate 36 being forced downwardly, may be forced down into gripping engagement with an

article 4 at a front area thereof, whereafter the article, now hanging in the hook 40, is driven upwardly along a forwardly and upwardly inclined belt stretch 42. This stretch runs in parallel with a support plate or frame 44, against which the downhanging end of the gripped article will be supported. At the top of the stretch 42 is provided a unit 46, which operates to produce a retraction or a rearward pivoting of the needle hook 40, which is thereby rapidly drawn out of its engagement with the front edge area of the article 4.

As the lower part of the article will already be free of the belt 32 no particular adhesion problems will be encountered, and also the foremost end portion will now be laid down on the support 44.

Hereby the article 4 will be transferred in an orderly manner from the belt 10 to the part 44, and thereafter the article may then, in more different manners, be further conveyed from this part, by way of example by means of a laterally oriented conveyor equipment. However, in Fig. 3 is indicated a preferred arrangement, whereby the part 44 is used for movably supporting a carrier plate 48, which, e.g. from a side position is introduced into a lower start position, in which the top edge of the first article 4 is laid off relatively close to the top edge of this plate. Thereafter a non-illustrated mechanism will serve to shoot the plate 48 a distance upwardly corresponding to the desired length displacement between articles 4 placed with imbricated formation, such that the next and the following articles will be deposited with just the desired positioning on the the plate 48. When this plate is fully covered, it is moved out in any suitable manner upwardly or laterally, now holding a predetermined total weight of the articles, and then a new carrier plate 48 may be supplied to the support structure 44.

It will be appreciated, generally that in accordan-

ce with the invention the totalled portion weight will refer to the weight of the articles 4, without comprising the weight of the carrier plate 48 as forming part of the final packing, i.e. the final weight indication will be highly real.

According to the invention it will be possible to work with another group of solutions, based on the use of suction cups for lifting off the articles from the belt 10 and depositing them in an orderly manner on the relevant support. However, in that case it will normally be a condition that the belt 10 is adapted to the purpose in not being smooth as otherwise desirable, e.g. in being granulated or finely perforated, for example consisting of a net material or of thin cords located closely side by side, such that the articles 4 cannot adhere to a smooth surface, from which they would be difficult to lift by suction from above.

A possible solution of this category is indicated in Fig. 4, where the net belt 10 passes a row of robot units 50 provided with one or more suction cups 52 which, by actuation of the single robot, may be moved inwardly and downwardly for gripping a selected article 4 passing on the belt, and lifting it off for delivery to a carrier plate 48. The robot itself may take care of arranging the successively picked up articles with the desired grouping pattern, but also here it is a possibility that the articles be deposited in a uniform manner on a plate 48, which, on a suitable support is displaced a step for each transfer operation. When the plate is filled up it can be discharged via a conveyor 56, whereafter a new plate is supplied from a magazine 58.

Fig. 5 illustrates another solution of a corresponding type, where at each receiver station there is mounted a transversely oriented belt 60 carrying outwardly projecting suction cups 62, which, in the lower run, are moved first across the belt 10 and then further

across a receiver station provided with an inserted carrier plate 48. The belt structure 60 can be raised and lowered e.g. by means of cylinders 64, whereby it can be actuated for the discussed selective gripping of article and lifting the same out for deposit on the plate 48. When the latter is displaced stepwise on its support 54 an imbricated grouping is directly achievable, and also here new plate members 48 may be supplied from a magazine 58.

Fig. 6 illustrates a further and basically different solution principle, by which the main belt conveyor 10 is modified for achieving that it is this conveyor itself which carries out the selective diversion of the articles to the respective receiver stations. As shown, the conveyor is made of a row of individual conveyor sections 66 which are each - in a manner not further illustrated - operable to be swung down at their front end 66', whereby it is possible for the single sections to effect a selective feeding of articles 4 to respective underlying receiver units 68, which may be units for longitudinal or transverse step displacement of article carrier plates 48, whereby the desired result is directly achievable. For that sake, the segments 66 could be upwardly pivotable as well, for delivery to receivers arranged overhead the belt 10,66, or even both up- and downwardly pivotable to upper and lower stations, respectively; from a capacity point of view this would correspond to a selective double sided delivery from the conveyor shown in Fig. 1.

An alternative could be to effect a regular lowering of the entire units 66', when selected, but the pivoting is preferred because an activated unit may then start to receive a new article adapted for passing that unit, already before the unit has been completely swung up.

To the extent the operation can proceed under safe

control the units 66' and even other diverter stations may be arranged with rather small pitch, whereby the sorter capacity for a given total length can be high. This may imply that there is correspondingly narrow space for the handling stations, and it could be possible, in that or other cases, to arrange for separate means of transportation from some or all of the receiving stations, e.g. from every second receiver station, to externally placed handling stations. In such stations the conditions will be to some degree the same as in the known cutting devices, viz. in that all arriving slices are destined for that station; thus, no controllable bypass means should be used.

In Fig. 7 is shown a principally corresponding solution, where the belt 10 currently delivers its flow of articles 4 to a continuing, overlying suction belt 70, which at each receiver station has a piston plate 72 operable by a cylinder 74 or a corresponding moving mechanism so as to screen off the load suction area of the belt, such that an article can be brought to a coordinated dropping down to an underlying collector unit, which, again, may comprise a mechanism for controlled stepwise displacement of a carrier plate for an article packing.

The means for stepwise displacing the carrier plates may be controllable in such a manner that the plates are displaced more or less all according to the size of the received articles. Hereby it will be possible, as the need arises, to arrange for a grouping of many small articles of fewer and larger articles for better utilization of the plate. Normally, differences in size will be detectable through the registered weight, but optionally the dynamic weight 2 may be supplemented or at the extreme even be replaced by a vision unit for detecting the article sizes.

The invention is not limited to the said basic

principle for the build-up of the article portions, viz. the formation of portions with a predetermined weight; by way of example it will also be possible to build up, on selected plates, portions of articles of identical weights. Thereby the different portions may have different weights, but since the total weight of the articles in each portion has been accurately registered by the computer this may be used to the effect that at the exit of the single stations or at a common exit from the entire system it will be possible to produce an automatic weight stamping and, optionally, a price stamping on the single packings. Also, it will be possible to effect a stamping indicative of the number of articles in the packings.

A further possibility will be that the different stations may operate selectively based on different criteria, e.g. some stations with the forming of portions of large articles up to a predetermined total weight and number of articles, others with articles of different sizes up to a predetermined weight or a predetermined number of articles, and still others with uniform articles to a variable total weight. Additionally, there may be one or more stations dealing with non-current articles, even without any ordered grouping or piling.

As already indicated it will be possible to use a vision unit for inspecting the articles passing by. If the articles are known to be of exactly the same thickness, it may be superfluous to use a weighing unit in the system, when the weight per area unit is known. With an added vision unit it will be possible to work with different kinds of articles at the same time, even based on different colours.

The grouping referred to should be understood in a wide sense, as it may also comprise a simple piling or, by way of example, a deposition into sections of an assortment packing. In a broader perspective the inven-

tion will comprise any kind of handling or working of the articles successively delivered to the single stations, irrespectively of their type and the detailed circumstances pertaining to their delivery from the main conveyor belt or a conveyor equivalent therewith. The articles will have been supplied according to some relevant criterion, and what is essential is that the batcher or sorter system is utilized for an orderly transfer for the selected articles to the receiver stations, in which the articles - as a consequence of their orderly or well defined transfer - may be handled or further treated by automatically operating means.

It should be emphasized that the said stepwise displacement of the carrier plates will not be restricted to a linear movement. According to the desired grouping pattern the movements may be directed in a variety of directions, also rearwardly, laterally and rotationally. The support element serving to receive the transferred articles should not necessarily be the final packing carrier plates, as the grouping may be arranged on a support belonging to the handling system, with a subsequent collective transfer of the groups to final carrier plates for incorporation in the packing products. It is even to be foreseen that the nicely grouped article portions can be delivered to sheet packings without any included carrier plate.

C L A I M S:

1. A method of forming weighed portions of food-stuff articles arranged in an orderly pattern, e.g. slices of salmon or, ham placed in imbricated formation on a carrier plate, characterized by the combination of effecting a supply of the articles to a plurality of grouping stations, based on an infeed flow of mutually spaced articles, which, after passage of a dynamic weighing unit and thereafter in a manner controlled by that unit, are selectively brought out to the different grouping stations for building up therein article groups of a known total weight, and of utilizing the single grouping stations as stations for an automatical laying out of the more or less regularly arriving articles in portions with any desired special grouping pattern of the articles.

2. A system for forming article portions by the method according to claim 1, characterized in that it comprises a sorter system for weight controlled joining of articles in a plurality of receiver stations, and that in connection with each of these stations means are provided for successively receiving the arriving articles and transferring them in an orderly manner to be laid out on suitable support means.

3. A system according to claim 2, characterized in that the sorter system is of the grader or batching type, i.e. having a sorting conveyor extending in continuity of a weighing station, on which conveyor the successively weighed articles are advanced along a row of receiver stations, at which diverter means are provided for selectively transferring articles on the conveyor to the single receiver stations, and in that the said diverter means are so adapted that they are operable to actively grip the articles on the conveyor and displace the gripped articles, independently of the conveyor

motion, to the respective laying out units.

4. A system according to claim 3, in which the diverter means, preferably made as mechanical gripping means, are arranged so as to convey the gripped articles to laying out units located overhead the sorting conveyor.

5. A system according to claim 3, in which the diverter means, preferably made as suction cups, are arranged so as to transfer the articles to laying out units located laterally of the sorting conveyor.

6. A system according to claim 2, in which the sorter system comprises a sectionized conveyor, the successive sections of which are individually pivotal to enable a selective direct transfer of articles to the laying out units.

7. A system according to claim 6, in which the sections are downwardly and/or upwardly pivotable.

8. A system according to claim 2, in which the sorter system comprises a downwardly facing conveyor surface, against which the articles are held by suction, and in which the conveyor surface is moved along a row of underlying laying out units, of which the articles may be dropped selectively by local suppression of the suction.

9. A system according to claim 2, in which the laying out units are provided with a magazine for carrier plates and with means for releasing a used carrier plate and supplying a new plate from the magazine in response to a control signal from a control unit associated with a weighing apparatus.

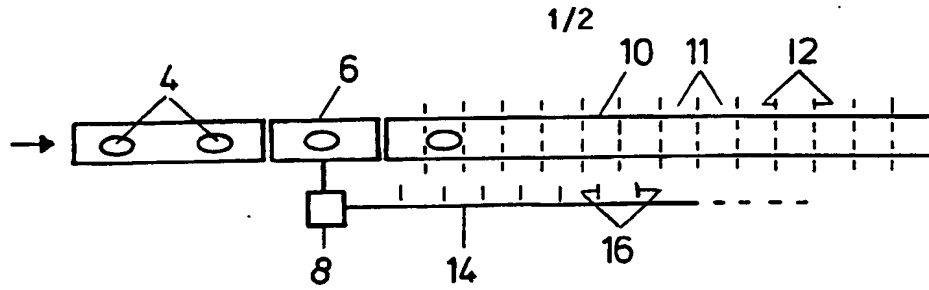


FIG. 1

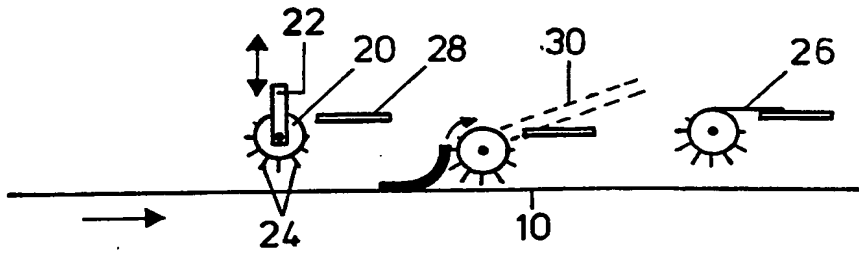


FIG. 2

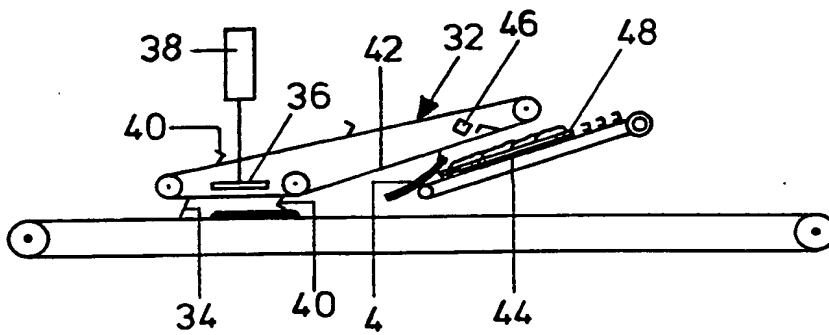


FIG. 3

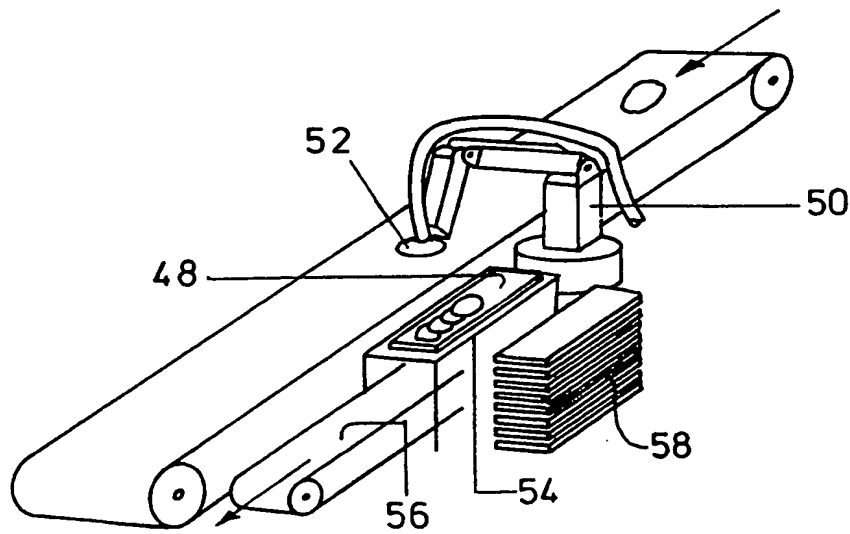
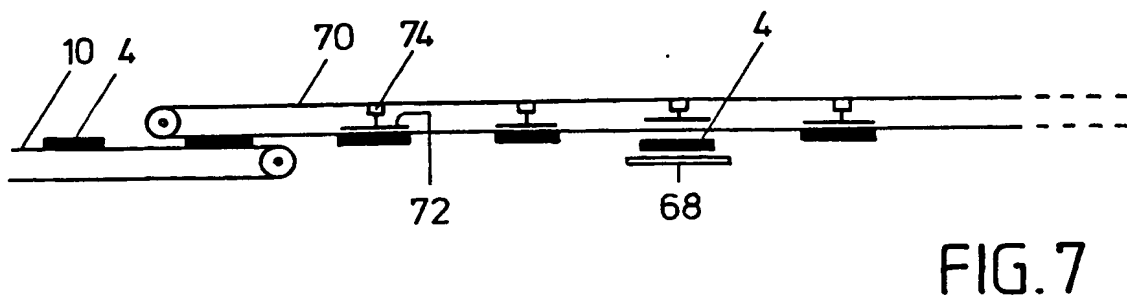
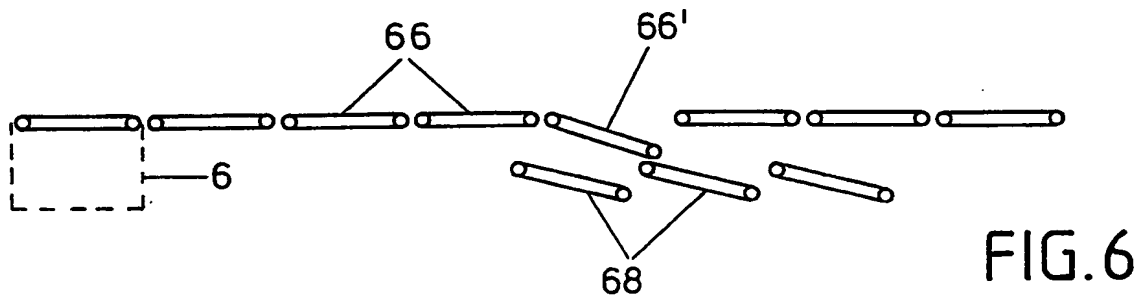
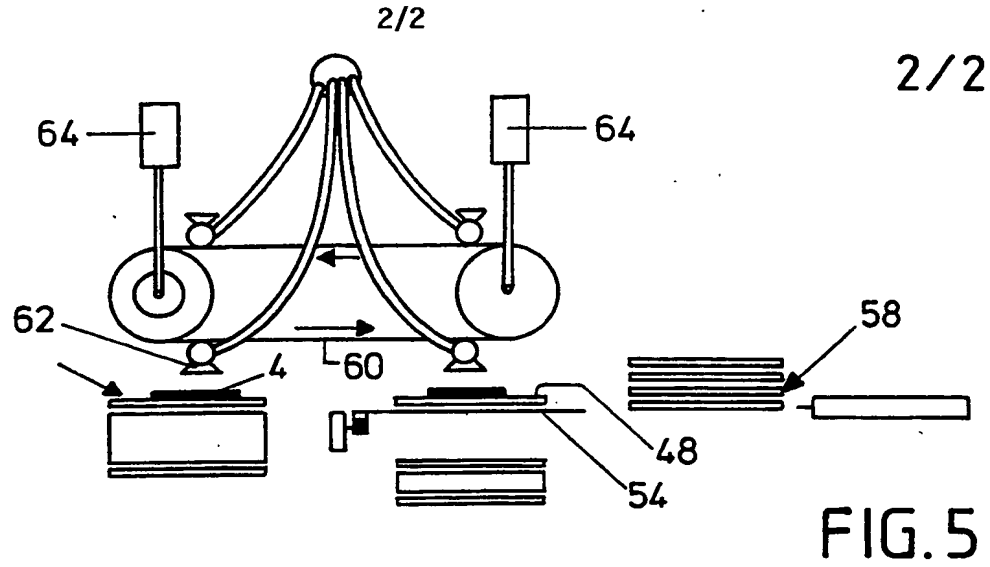


FIG. 4

SUBSTITUTE SHEET



SUBSTITUTE SHEET

INTERNATIONAL SEARCH REPORT

International application No.

PCT/DK 95/00253

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: B65B 25/06, B65B 35/10

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: B65B, B65G

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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A	US 3820428 A (MARSHALL ET AL.), 28 June 1974 (28.06.74) --	1-9
A	DE 3733945 A1 (WEBER, GÜNTHER), 20 April 1989 (20.04.89) --	1-9
A	EP 0428361 A1 (WARNER-LAMBERT COMPANY), 22 May 1991 (22.05.91) --	1-9

☒ Further documents are listed in the continuation of Box C.☒ See patent family annex.

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Date of the actual completion of the international search

4 October 1995

Date of mailing of the international search report

06-10-1995

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International application No.

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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
P,A	EP 0634325 A1 (DIXIE-UNION VERPACKUNGEN GMBH), 18 January 1995 (18.01.95) -----	1-9

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INTERNATIONAL SEARCH REPORT
Information on patent family members

28/08/95

International application No.
PCT/DK 95/00253

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